Notice of Allowability	Application No.	Applicant(s)	
	09/639,870	DEJACK ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *October 15, 2004*.

2. ☒ The allowed claim(s) is/are *7-11,19-23 and 25-32*.

3. ☒ The drawings filed on *16 April 2004* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER

DETAILED ACTION

Introduction

1. This communication is in response to the Applicants' response filed on October 15, 2004. Claims 7-10, 19-22, 27 and 31 were amended. Claims 1-2, 4-11, 13-23 and 25-32 of the application are pending.

Examiner's Amendment

2. Authorization for this examiner's amendment was given in a telephone interview with Mr. Daniel Bliss on January 5, 2005.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

3. In the Claims:

Claims 1-6 have been cancelled.

In amended claim 9, Lines 13-15, "nodes created for each transition portion of the fastener transitioning between the non-threaded portion of the threaded block and a threaded portion of the block"

has been changed to

-- nodes created for each transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded portion of the block --.

In amended claim 10, Lines 14-16, "nodes created for each transition portion of the fastener transitioning between the non-threaded portion of the threaded block and a threaded portion of the block"

has been changed to

-- nodes created for each transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded portion of the block --.

Claims 13-18 have been cancelled.

In amended claim 21, Lines 16-17, "creating nodes for each transition portion of the fastener transitioning between the non-threaded portion of the threaded block and a threaded portion of the block"

has been changed to

-- creating nodes for each transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded portion of the block --.

In amended claim 22, Lines 16-17, "creating nodes for each transition portion of the fastener transitioning between the non-threaded portion of the threaded block and a threaded portion of the block"

has been changed to

-- creating nodes for each transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded portion of the block --.

Reasons for Allowance

3. Claims 7-11, 19-23 and 25-32 of the application are allowed over prior art of record.

4. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) a method and device for generating a mesh for a region of an object to be analyzed using numerical analysis such as finite element method, finite difference method, boundary element method etc.; when performing mesh generation for analysis under finite element method for electromagnetic fields or temperature for objects, it is necessary to perform mesh generation for the region surrounding the object to be analyzed; the generation of the mesh involves division of the region to be analyzed into elements defined by line segments or into triangles, quadrangles, tetrahedrons, hexahedrons etc; mesh is generated using three-dimensional mesh elements; the geometric model of the object and the surrounding space may be specified using

rectangular, cylindrical or polar coordinates; the coordinates used for mesh generation may be rectangular, cylindrical or polar coordinates (**Sakaguchi et al.**, U.S. Patent 5,946,479);

(2) Composite fasteners that can be used in hotter regions than metal fasteners; the composite fastener includes a composite body and a metal coupling attached to the body; the metal coupling has threads on the external surface to engage an externally threaded device; finite element representations of the fastener and the liner is used to analyze the design of the fastener and liner in regard to thermal and structural performance; the finite element models are also used to analyze stress in the fastener with respect to boundary conditions and manufacturing tolerances; (**Miller et al.**, U.S. Patent 6,045,310); and

(3) a helical coordinate system to solve problems in helical structures; the helical coordinate system has a family of coordinate curves that coincide with the helix of the thread (**Zicheng et al.**, "A study of helical coordinate system and Helical slow wave structure", IEEE 1998).

4.1 Applicants' first set of claims consists of Claim 7.

Independent Claim 7 is directed to a system of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein a mesh of the fastener threads includes:

a mesh of a first thread of the fastener threads, wherein nodes are created using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes;

a mesh of a thread body of the fastener threads, wherein nodes are created using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes; and

a mesh of a last thread of the fastener threads, wherein nodes are created using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and elements are defined by interconnecting the nodes".

The closest prior art fails to teach or fairly suggest wherein a mesh of the fastener threads includes a mesh of a first thread of the fastener threads, wherein nodes are created using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes; a mesh of a thread body of the fastener threads, wherein nodes are created using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes; and a mesh of a last thread of the fastener threads, wherein nodes are created using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and elements are defined by interconnecting the nodes, as claimed by the Applicants. Therefore, Claim 7 is deemed novel and allowable.

4.2 Applicants' second set of claims consists of Claims 8 and 11.

Independent Claim 8 is directed to a system of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said mesh of the fastener threads includes:

a growth thread profile for the first thread of the fastener threads created by taking a vertical cross-section through a thread between columns of hexahedral elements;

a constant thread profile created using hexahedral element for the thread body of the fastener threads;

a shrink thread profile created for the last thread of the fastener threads; and

a helical mesh of the fastener threads created by spinning the growth thread profile, constant thread profile and shrink thread profile".

The closest prior art fails to teach or fairly suggest wherein said mesh of the fastener threads includes a growth thread profile for the first thread of the fastener threads created by taking a vertical cross-section through a thread between columns of hexahedral elements; a constant thread profile created using hexahedral element for the thread body of the fastener threads; a shrink thread profile created for the last thread of the fastener threads; and a helical mesh of the fastener threads created by spinning the growth thread profile, constant thread profile and shrink thread profile, as claimed by the Applicants. Therefore, Claims 8 and 11 are deemed novel and allowable.

4.3 Applicants' third set of claims consists of Claim 9.

Independent Claim 9 is directed to a system of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said mesh of the threaded block threads includes:

a mesh of a first thread of the threaded block threads, wherein nodes are created using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements are defined by interconnecting the nodes;

a mesh of a thread body of the threaded block threads, wherein nodes are created using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes; and

a mesh of a last thread of the threaded block threads, wherein nodes are created using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes".

The closest prior art fails to teach or fairly suggest wherein said mesh of the threaded block threads includes a mesh of a first thread of the threaded block threads, wherein nodes are created using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements are defined by interconnecting the nodes; a mesh of a thread body of the threaded block threads, wherein nodes are created using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes; and a mesh of a last thread of the threaded block threads, wherein nodes are created using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and elements defined by interconnecting the nodes, as claimed by the Applicants. Therefore, Claim 9 is deemed novel and allowable.

4.4 Applicants' fourth set of claims consists of Claim 10 and 11.

Independent Claim 10 is directed to a system of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said mesh of the threaded block threads includes:

a growth thread profile for the first thread of the threaded block threads created by taking a vertical cross-section through a thread between columns of hexahedral elements;

a constant thread profile created using hexahedral elements for thread body of the threaded block threads;

a shrink thread profile created for the last thread of the threaded block threads; and

a helical mesh of the threaded block threads created by spinning the growth thread profile, constant thread profile and shrink thread profile".

The closest prior art fails to teach or fairly suggest wherein said mesh of the threaded block threads includes a growth thread profile for the first thread of the threaded block threads created by taking a vertical cross-section through a thread between columns of hexahedral elements; a constant thread profile created using hexahedral elements for thread body of the threaded block threads; a shrink thread profile created for the last thread of the threaded block threads; and a helical mesh of the threaded block threads created by spinning the growth thread profile, constant thread profile and shrink thread profile, as claimed by the Applicants. Therefore, Claims 10 and 11 are deemed novel and allowable.

4.5 Applicants' fifth set of claims consists of Claim 19.

Independent Claim 19 is directed to a method of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said step of generating a mesh of the fastener threads includes the steps of:

meshing a first thread of the fastener threads by creating nodes using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes;

meshing a thread body of the fastener threads by creating nodes using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes; and

meshing a last thread of the fastener threads by creating nodes using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes".

The closest prior art fails to teach or fairly suggest wherein said step of generating a mesh of the fastener threads includes the steps of:

meshing a first thread of the fastener threads by creating nodes using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes;

meshing a thread body of the fastener threads by creating nodes using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes; and

meshing a last thread of the fastener threads by creating nodes using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes, as claimed by the Applicants. Therefore, Claim 19 is deemed novel and allowable.

4.6 Applicants' sixth set of claims consists of Claim 20 and 23.

Independent Claim 20 is directed to a method of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said step of generating a mesh of the fastener threads includes the steps of:

creating a growth thread profile for the first thread of the fastener threads by taking a vertical cross-section through a thread between columns of hexahedral elements;

creating a constant thread profile using hexahedral elements for the thread body of the fastener threads;

creating a shrink thread profile for the last thread of the fastener threads; and

spinning the growth thread profile, constant thread profile and shrink thread profile into a helical mesh of the fastener threads".

The closest prior art fails to teach or fairly suggest wherein said step of generating a mesh of the fastener threads includes the steps of: creating a growth thread profile for the first thread of the fastener threads by taking a vertical cross-section through a thread between columns of hexahedral elements; creating a constant thread profile using hexahedral elements for the thread body of the fastener threads; creating a shrink thread profile for the last thread of the fastener threads; and spinning the growth thread profile, constant thread profile and shrink thread profile into a helical mesh of the fastener threads, as claimed by the Applicants. Therefore, Claims 20 and 23 are deemed novel and allowable.

4.7 Applicants' seventh set of claims consists of Claim 21.

Independent Claim 21 is directed to a method of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said step of generating a mesh of the threaded block threads includes the steps of:

meshing a first thread of the threaded block threads by creating nodes using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes;

meshing a thread body of the threaded block threads by creating nodes using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes; and

meshing a last thread of the threaded block threads by creating nodes using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes".

The closest prior art fails to teach or fairly suggest wherein said step of generating a mesh of the threaded block threads includes the steps of:

meshing a first thread of the threaded block threads by creating nodes using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes;

meshing a thread body of the threaded block threads by creating nodes using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes; and

meshing a last thread of the threaded block threads by creating nodes using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes, as claimed by the Applicants. Therefore, Claim 21 is deemed novel and allowable.

4.8 Applicants' eighth set of claims consists of Claims 22 and 23.

Independent Claim 22 is directed to a method of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"wherein said step of generating a mesh of the threaded block threads includes the steps of:

creating a growth thread profile for the first thread of the threaded block threads by taking a vertical cross-section through a thread between columns of hexahedral elements;

creating a constant thread profile using hexahedral elements for thread body of the threaded block threads;

creating a shrink thread profile for the last thread of the threaded block threads; and

spinning the growth thread profile, constant thread profile and shrink thread profile into a helical mesh of the threaded block threads".

The closest prior art fails to teach or fairly suggest wherein said step of generating a mesh of the threaded block threads includes the steps of: creating a growth thread profile for the first thread of the threaded block threads by taking a vertical cross-section through a thread between columns of hexahedral elements; creating a constant thread profile using hexahedral elements for thread body of the threaded block threads; creating a shrink thread profile for the last thread of the threaded block threads; and spinning the growth thread profile, constant thread profile and shrink thread profile into a helical mesh of the threaded block threads, as claimed by the Applicants. Therefore, Claims 22 and 23 are deemed novel and allowable.

4.9 Applicants' ninth set of claims consists of Claims 25-28.

Independent Claim 25 is directed to a method of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"meshing a first thread of a bolt thread by creating nodes using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes in a varying numerical sequence;

meshing a thread body of the bolt threads by creating nodes using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes in a varying numerical sequence;

meshing a last thread of the bolt thread by creating nodes using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical axis, and defining elements by interconnecting; the nodes in a varying numerical sequence".

The closest prior art fails to teach or fairly suggest meshing a first thread of a bolt thread by creating nodes using gradual stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes in a varying numerical sequence;

meshing a thread body of the bolt threads by creating nodes using constant stretching on a helix by moving nodes upwards to helical coordinates while sweeping about a vertical axis, and defining elements by interconnecting the nodes in a varying numerical sequence;

meshing a last thread of the bolt thread by creating nodes using gradual shrinking on a helix by moving nodes downward to cylindrical coordinates while sweeping about a vertical

axis, and defining elements by interconnecting; the nodes in a varying numerical sequence, as claimed by the Applicants. Therefore, Claims 25-28 are deemed novel and allowable.

4.10 Applicants' tenth set of claims consists of Claims 29-32.

Independent Claim 29 is directed to a method of generating a finite element mesh for a threaded fastener and joining structure assembly. The claim identifies the uniquely distinct features of:

"creating a growth thread profile for a first thread of the bolt threads by taking a vertical cross-section through a thread between columns of hexahedral elements;

creating a constant thread profile using hexahedral elements for a thread body of the bolt threads;

creating a shrink thread profile for the last thread of the bolt threads;

spinning the growth thread profile, constant thread profile and shrink thread profile into a helical mesh of the bolt threads".

The closest prior art fails to teach or fairly suggest creating a growth thread profile for a first thread of the bolt threads by taking a vertical cross-section through a thread between columns of hexahedral elements; creating a constant thread profile using hexahedral elements for a thread body of the bolt threads; creating a shrink thread profile for the last thread of the bolt threads; spinning the growth thread profile, constant thread profile and shrink thread profile into a helical mesh of the bolt threads, as claimed by the Applicants. Therefore, Claims 29-32 are deemed novel and allowable.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
January 5, 2005

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER